

SECTION 02621

GEOCOMPOSITE DRAINAGE LAYER

PART 1: GENERAL

1.01 SECTION INCLUDES

- A. Specifications and guidelines for MANUFACTURING and INSTALLING geocomposite.

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - 1. D 1505-98 Standard Test Method for Density of Plastics by the Density-Gradient Technique
 - 2. D 1603-94 Standard Test Method for Carbon Black in Olefin Plastics
 - 3. D 4355-02 Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus
 - 4. D 4491-99 Standard Test Method for Water Permeability of Geotextiles by Permittivity
 - 5. D 4716-00 Standard Test Method for Determining the (In-Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head
 - 6. D 4751-99 Standard Test Method for Determining Apparent Opening Size of a Geotextile
 - 7. D 4833-88 (1996) Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes and Related Products
 - 8. D 5035-95 Standard Test Method for Breaking Force and Elongation of Textile Fabrics (Strip Method)
 - 9. D 5199-99 Standard Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes
 - 10. D 5261-92 (1996) Standard Test Method for Measuring the Mass Per Unit Area of Geotextiles
 - 11. D7005-03 Determining The Bond Strength (Ply-Adhesion) of Geocomposites
- B. Relevant publications from the Environmental Protection Agency (EPA):
 - 1. Daniel, D.E. and R.M. Koerner, (1993), *Technical Guidance Document: Quality Assurance and Quality Control for Waste Containment Facilities*, EPA/600/R-93/182.

1.03 DEFINITIONS

- A. Construction Quality Assurance Consultant (CONSULTANT)- Party, independent from MANUFACTURER and INSTALLER that is responsible for observing and documenting activities related to quality assurance during the lining system construction.

- B. ENGINEER- The individual or firm responsible for the design and preparation of the project's Contract Drawings and Specifications.
- C. Geocomposite Manufacturer (MANUFACTURER)- The party responsible for manufacturing the geocomposite rolls.
- D. Geosynthetic Quality Assurance Laboratory (TESTING LABORATORY)- Party, independent from the MANUFACTURER and INSTALLER, responsible for conducting laboratory tests on samples of geosynthetics obtained at the site or during manufacturing, usually under the direction of the OWNER.
- E. INSTALLER- Party responsible for field handling, transporting, storing and deploying the geocomposite.
- F. Lot- A quantity of resin (usually the capacity of one rail car) used to manufacture polyethylene geocomposite rolls. The finished rolls will be identified by a roll number traceable to the resin lot.

1.04 QUALIFICATIONS

A. MANUFACTURER

- 1. Geocomposite shall be manufactured by the following:
 - a. GSE Lining Technology, Inc.
 - b. approved equal
- 2. MANUFACTURER shall have manufactured a minimum of 10,000,000 square feet of polyethylene geocomposite material during the last year.

B. INSTALLER

- 1. INSTALLER shall have installed a minimum of 500,000 square feet of geocomposite in the last 3 years.
- 2. INSTALLER shall have worked in a similar capacity on at least 5 projects similar in complexity to the project described in the contract documents, and with in at least 50,000 square feet of geonet installation on each project.
- 3. The Installation Supervisor shall have worked in a similar capacity on projects similar in size and complexity to the project described in the Contract Documents.

1.05 MATERIAL LABELING, DELIVERY, STORAGE AND HANDLING

- A. Labeling- Each roll delivered to the site shall be wrapped and labeled by the MANUFACTURER. The label will identify:
 - 1. manufacturer's name
 - 2. product identification
 - 3. length
 - 4. width
 - 5. roll number

- B. Delivery- Rolls will be prepared to ship by appropriate means to prevent damage to the material and to facilitate off-loading.
- C. Storage- The on-site storage location provided by the CONTRACTOR to protect the geonet from abrasions, excessive dirt and moisture shall have the following characteristics:
 - 1. level (no wooden pallets)
 - 2. smooth
 - 3. dry
 - 4. protected from theft and vandalism
 - 5. adjacent to the area being lined
- D. Handling
 - 1. The CONTRACTOR and INSTALLER shall handle all rolls in such a manner to ensure they are not damaged in any way.
 - 2. The INSTALLER shall take any necessary precautions to prevent damage to underlying layers during placement of the drainage material.

1.06 WARRANTY

- A. Material shall be warranted, on a pro-rata basis against defects for a period of 1-year from the date of the geocomposite installation.
- B. Installation shall be warranted against defects in workmanship for a period of 1-year from the date of geocomposite completion.

PART 2: PRODUCTS

2.01 GEOCOMPOSITE PROPERTIES

- A. A geocomposite shall be manufactured by extruding two crossing strands to form a bi-planar drainage net structure with a non-woven geotextile bonded to one or both sides.
- B. The geocomposite specified shall have properties that meet or exceed the values listed in the far right column of the table below.

TESTED PROPERTY	TEST METHOD	FREQUENCY	MINIMUM AVERAGE ROLL VALUE ^(a)		
Geocomposite			6 oz/yd ²	8 oz/yd ²	10 oz/yd ²
Product Code			F42060060S	F42080080S	F42100100S
Transmissivity ^(b) , gal/min/ft (m ² /sec)	ASTM D 4716	1/540,000 ft ²	0.48 (1 x 10 ⁻⁴)	0.48 (1 x 10 ⁻⁴)	0.43 (9 x 10 ⁻⁵)
Ply Adhesion, lb/in (g/cm)	ASTM D 7005	1/50,000 ft ²	1.0 (178)	1.0 (178)	1.0 (178)
Roll Width ^(c) , ft (m)			14.5 (4.4)	14.5 (4.4)	14.5 (4.4)
Roll Length ^(c) , ft (m)			230 (70.1)	200 (60.9)	190 (58.0)
Roll Area, ft ² (m ²)			3,335 (310)	2,900 (269)	2,755 (256)
Geonet core ^(d)					
Transmissivity ^(b) , gal/min/ft (m ² /sec)	ASTM D 4716		9.66 (2 x 10 ⁻³)	9.66 (2 x 10 ⁻³)	9.66 (2 x 10 ⁻³)
Thickness, mil (mm)	ASTM D 5199	1/50,000 ft ²	200 (5)	200 (5)	200 (5)
Density, g/cm ³	ASTM D 1505	1/50,000 ft ²	0.94	0.94	0.94
Tensile Strength (MD), lb/in (N/mm)	ASTM D 5035	1/50,000 ft ²	45 (7.9)	45 (7.9)	45 (7.9)
Carbon Black Content, %	ASTM D 1603	1/50,000 ft ²	2.0	2.0	2.0
Geotextile (prior to lamination) ^(d,e)					
Mass per Unit Area, oz/yd ² (g/m ²)	ASTM D 5261	1/90,000 ft ²	6 (200)	8 (270)	10 (335)
Grab Tensile, lb (N)	ASTM D 4632	1/90,000 ft ²	170 (755)	220 (975)	260 (1,155)
Puncture Strength, lb (N)	ASTM D 4833	1/90,000 ft ²	90 (395)	120 (525)	165 (725)
AOS, US sieve (mm)	ASTM D 4751	1/540,000 ft ²	70 (0.212)	80 (0.180)	100 (0.150)
Permittivity, (sec ⁻¹)	ASTM D 4491	1/540,000 ft ²	1.5	1.5	1.2
Flow Rate, gpm/ft ² (lpm/m ²)	ASTM D 4491	1/540,000 ft ²	110 (4,480)	110 (4,480)	85 (3,460)
UV Resistance, % retained	ASTM D 4355 (after 500 hours)	once per formulation	70	70	70

NOTES:

- ^(a)These are MARV values that are based on the cumulative results of specimens tested and determined by GSE. AOS in mm is a maximum average roll value.
- ^(b)Gradient of 0.1, normal load of 10,000 psf, water at 70° F between steel plates for 15 minutes.
- ^(c)Roll widths and lengths have a tolerance of ±1%.
- ^(d)Component properties prior to lamination.
- ^(e)Refer to geotextile product data sheet for additional specifications.

C. Resin

1. Resin shall be new first quality, compounded polyethylene resin.
2. Natural resin (without carbon black) shall meet the following additional minimum requirements:

Table 02621-3 – Sample Table

Property	Test Method	Value
Density (g/cm ³)	ASTM D 1505	>0.94
Melt Flow Index (g/10 min)	ASTM D 1238	≤1.0

2.02 MANUFACTURING QUALITY CONTROL

- A. The geocomposite shall be manufactured in accordance with the Manufacturer's Quality Control Plan submitted to and approved by the ENGINEER.
- B. The geocomposite shall be tested according to the test methods and frequencies listed below:

Manufacturing Quality Control Test Frequencies

Characteristics	Test Method	Units	FREQUENCY
			Bi-Planar
<i>Resin</i>			
Polymer Density	ASTM D 1505	g/cm ³	Once Per Lot
Melt Flow Index	ASTM D 1238	g/10 min	Once Per Lot
<i>Geonet Test</i>			
Carbon Black	ASTM D 1603	%	1/50,000 ft ²
Tensile Strength, MD	ASTM D 5035	lb/ ft	1/50,000 ft ²
Density	ASTM D 1505	g/cm ³	1/50,000 ft ²
<i>Geotextile Tests</i>			
Mass per Unit Area	ASTM D 5261	oz/yd ²	1/90,000 ft ²
Grab Tensile	ASTM D 4632	lb	1/90,000 ft ²
Puncture	ASTM D 4833	lb	1/90,000 ft ²
AOS, US Sieve	ASTM D 4751	mm	1/540,000 ft ²
Water Flow Rate	ASTM D 4491	gpm/ft ²	1/540,000 ft ²
UV Resistance	ASTM D 4355 (after 500 hours)	% retained	Once per resin formulation
<i>Geocomposite Tests</i>			
Ply Adhesion	ASTM D7005	lb/in	1/50,000 ft ²
Transmissivity	ASTM D 4716	m ² /sec	1/540,000 ft ²

PART 3: EXECUTION

3.01 FAMILIARIZATION

A. Inspection

1. Prior to implementing any of the work in the Section to be lined, the INSTALLER shall carefully inspect the installed work of all other Sections and verify that all work is complete to the point where the installation of the Section may properly commence without adverse impact.
2. If the INSTALLER has any concerns regarding the installed work of other Sections, he shall notify the Project ENGINEER.

3.02 MATERIAL PLACEMENT

- A. The geocomposite roll should be installed in the direction of the slope and in the intended direction of flow unless otherwise specified by the ENGINEER.
- B. If the project contains long, steep slopes, special care should be taken so that only full length rolls are used at the top of the slope.
- C. In the presence of wind, all geocomposites shall be weighted down with sandbags or the equivalent. Such sandbags shall be used during placement and remain until replaced with cover material.

- D. In applying fill material, no equipment can drive directly across the geocomposite. The specified fill material shall be placed and spread utilizing vehicles with a low ground pressure.
- E. The cover soil shall be placed on the geocomposite in a manner that prevents damage to the geocomposite. Placement of the cover soil shall proceed immediately following the placement and inspection of the geocomposite.

3.03 SEAMS AND OVERLAPS

- A. Each component of the geocomposite will be secured or seamed to the like component at overlaps.
- B. Geonet Components
 - 1. Adjacent edges of the geonet along the length of the geocomposite roll shall be placed with the edges of each geonet butted against each other.
 - 2. The overlaps shall be joined by tying the geonet structure with cable ties. These ties shall be spaced every 5 feet along the roll length.
 - 3. Adjoining geocomposite rolls (end to end) across the roll width should be shingled down in the direction of the slope, with the geonet portion of the top overlapping the geonet portion of the bottom geocomposite a minimum of 12 inches across the roll width.
 - 4. The geonet portion should be tied every 6 inches in the anchor trench or as specified by the ENGINEER.

3.04 REPAIR

- A. Prior to covering the deployed geocomposite, each roll shall be inspected for damage resulting from construction.
- B. Any rips, tears or damaged areas on the deployed geocomposite shall be removed and patched. The patch shall be secured to the original geonet by tying every 6 inches with the approved tying devices. If the area to be repaired is more than 50 percent of the width of the panel, the damaged area shall be cut out and the two portions of the geonet shall be cut out and the two portions of the geonet shall be joined in accordance with Subsection 3.03.

END OF SECTION